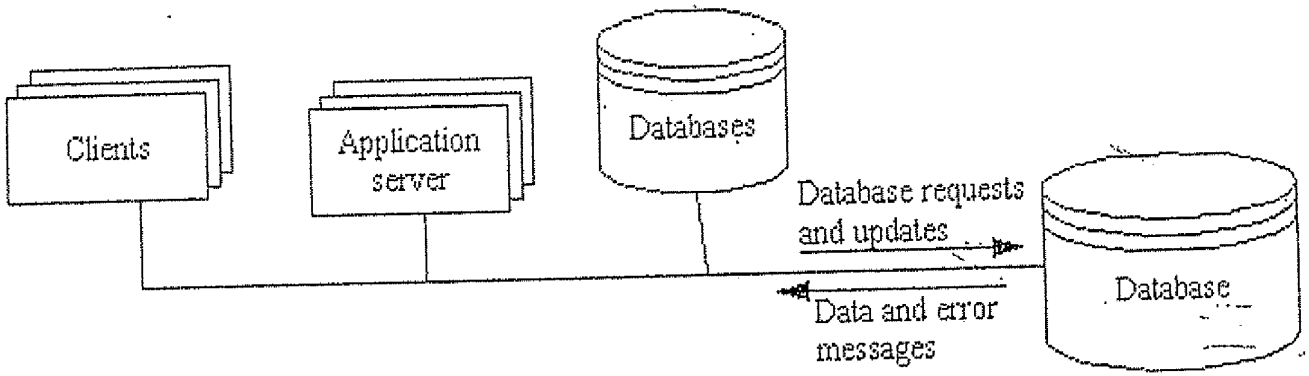


Prior Art FIG 1

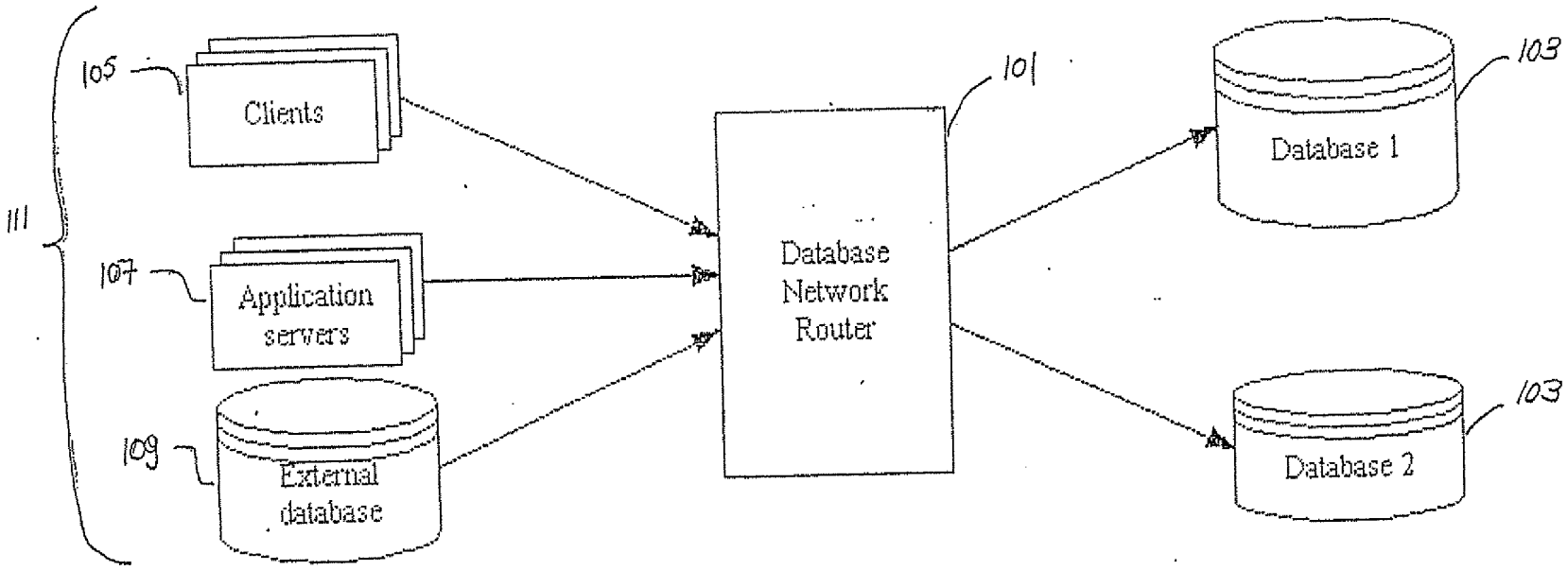


Fig. 2

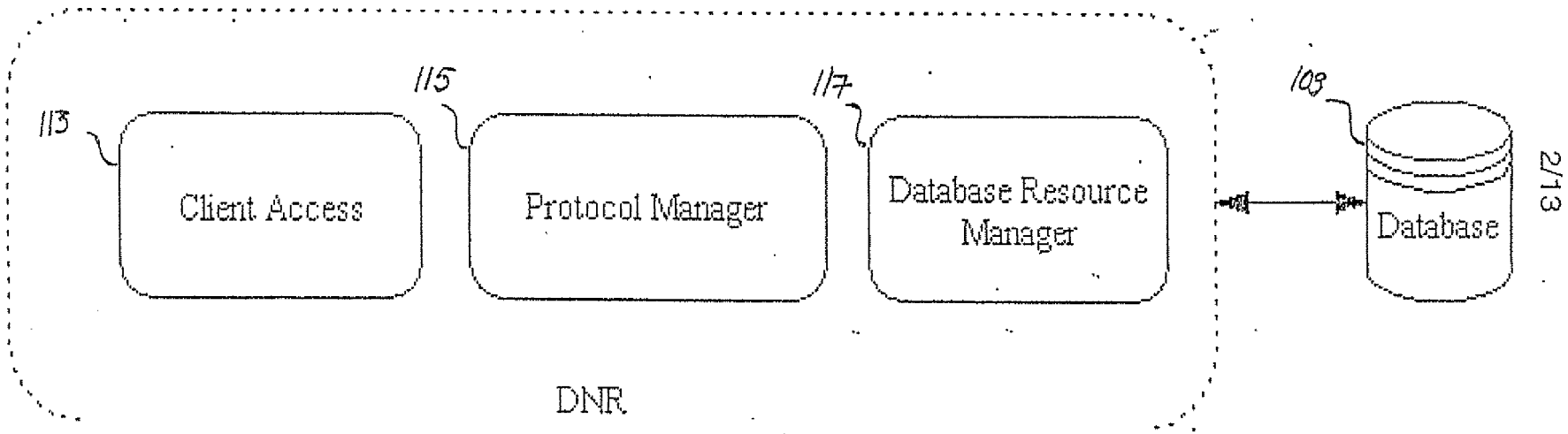

113
115
117
103
Client Access
Protocol Manager
Database Resource Manager
Database
DNR

FIG 3

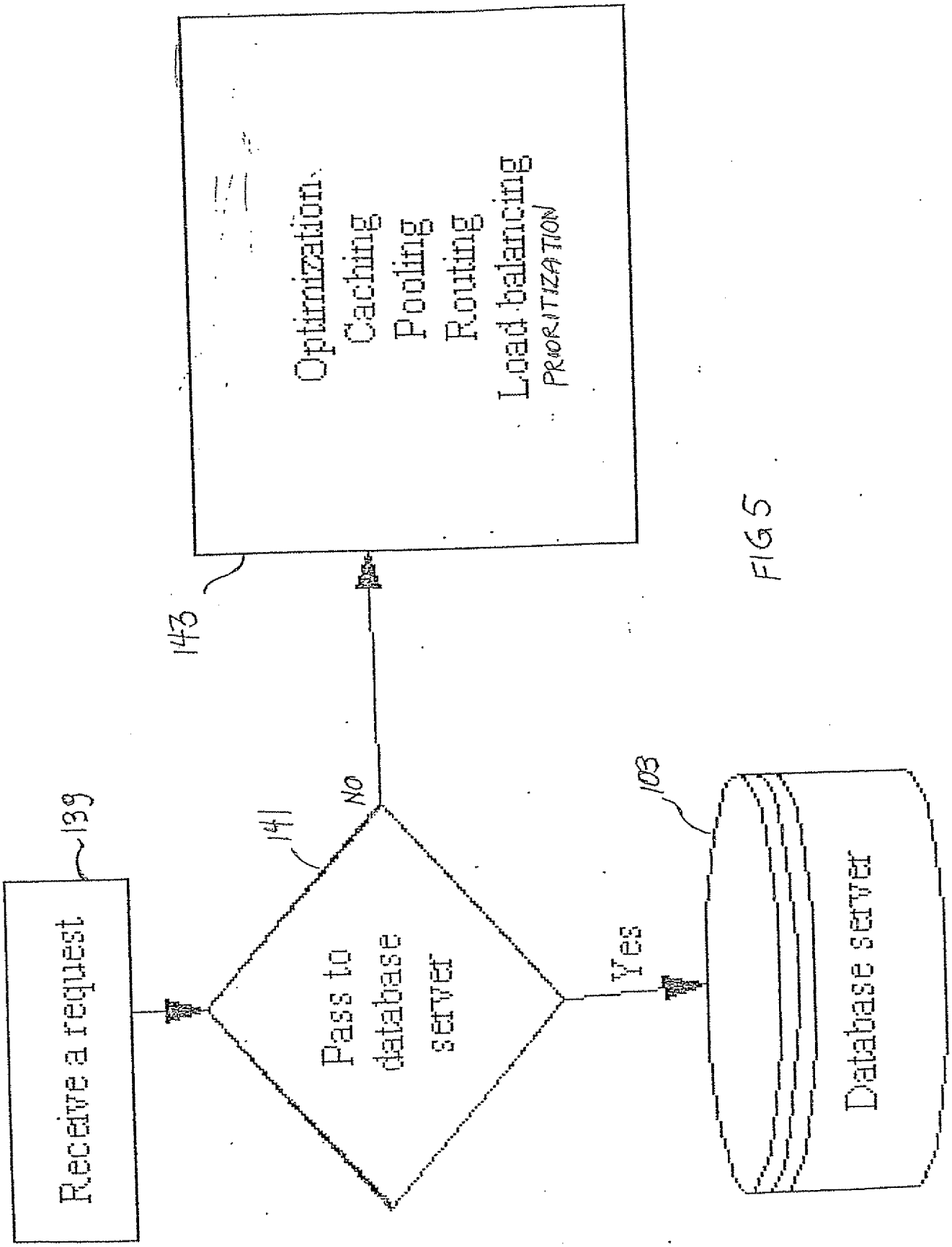

Optimization
Caching
Pooling
Routing
Load balancing
PRIORITIZATION
143
No
141
Pass to database server
Yes
103
Database server
139
Receive a request

FIG 5

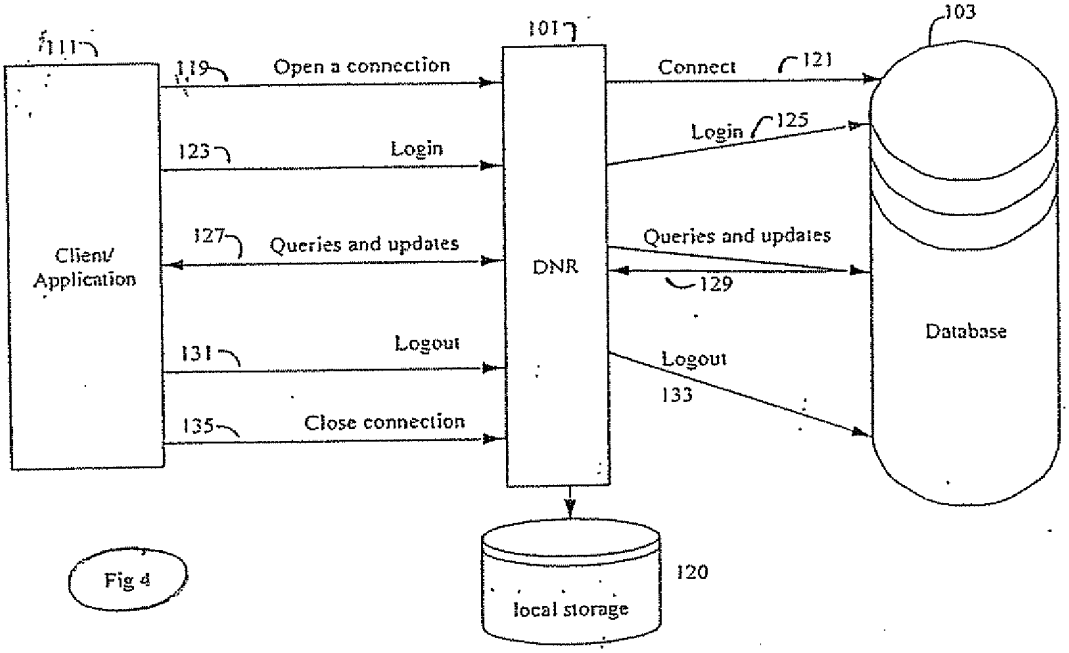

111
Client/
Application
119
Open a connection
123
Login
127
Queries and updates
131
Logout
135
Close connection
101
DNR
Connect
121
Login
125
Queries and updates
129
Logout
133
103
Database
120
local storage

Fig 4

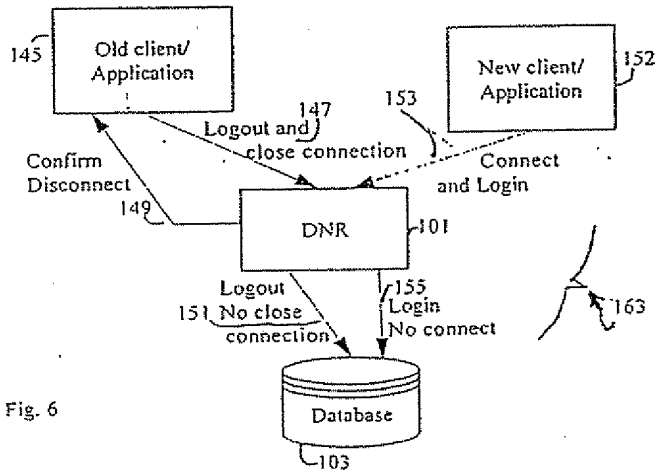

145
Old client/
Application
New client/
Application
152
147
Logout and
close connection
153
Confirm
Disconnect
149
Connect
and Login
DNR
101
Logout
151 No close
connection
155
Login
No connect
163
Database
103

Fig. 6

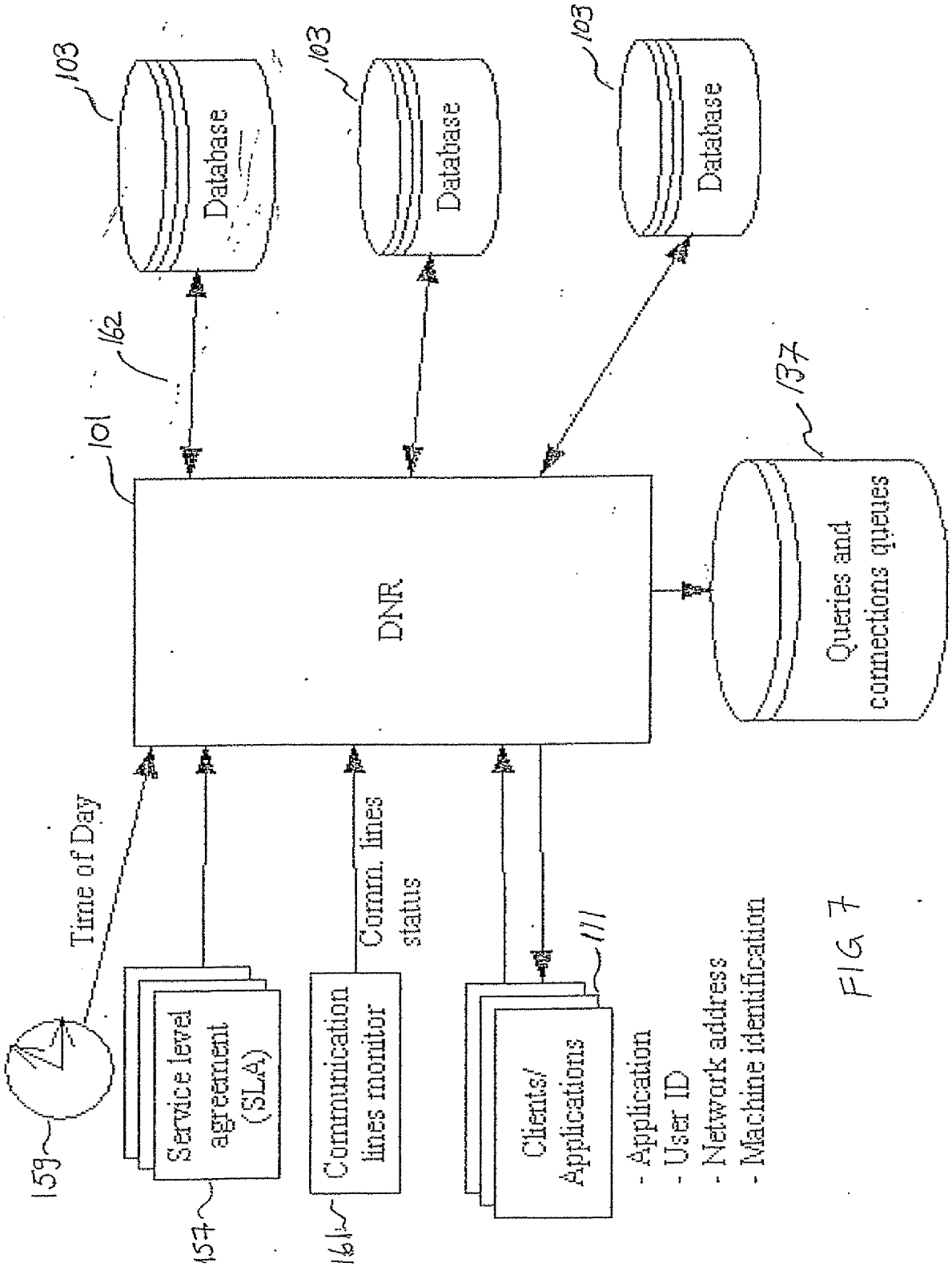


FIG 7

Pooling, routing and prioritization

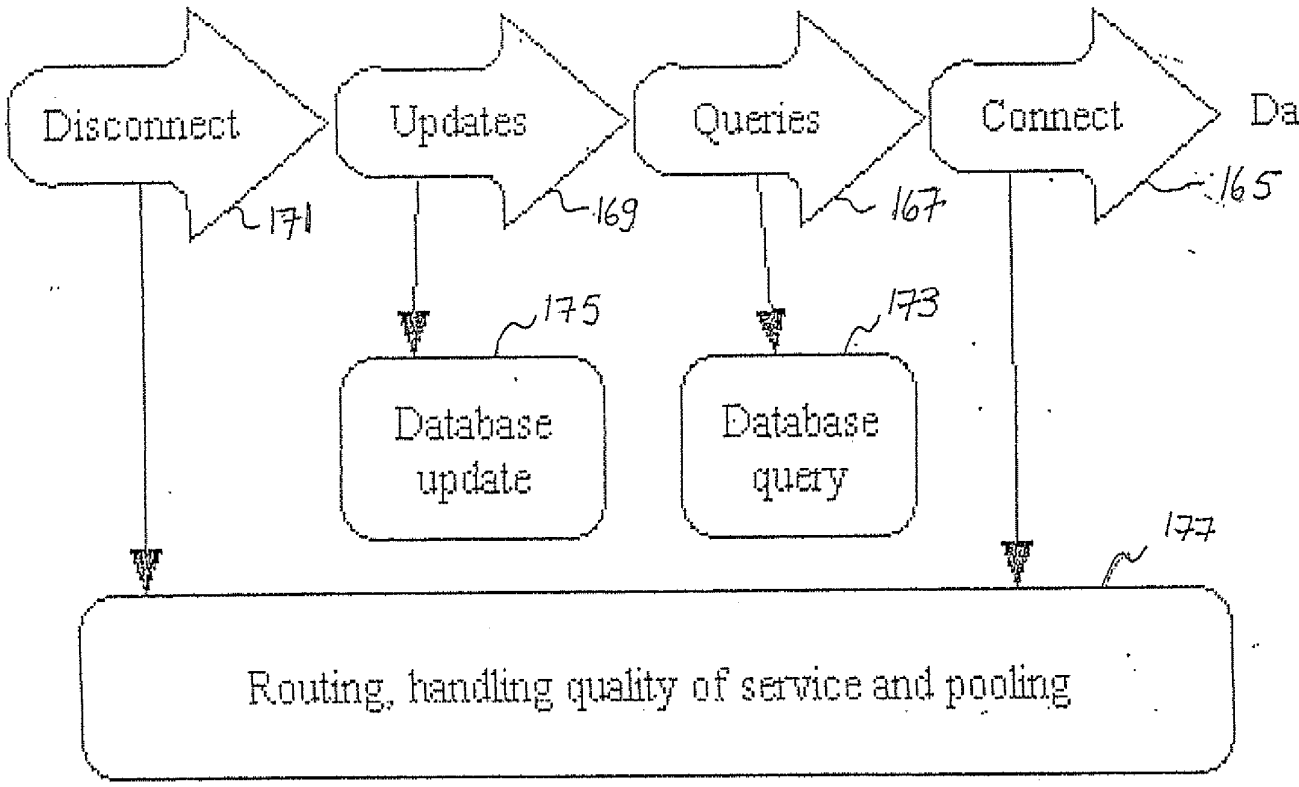
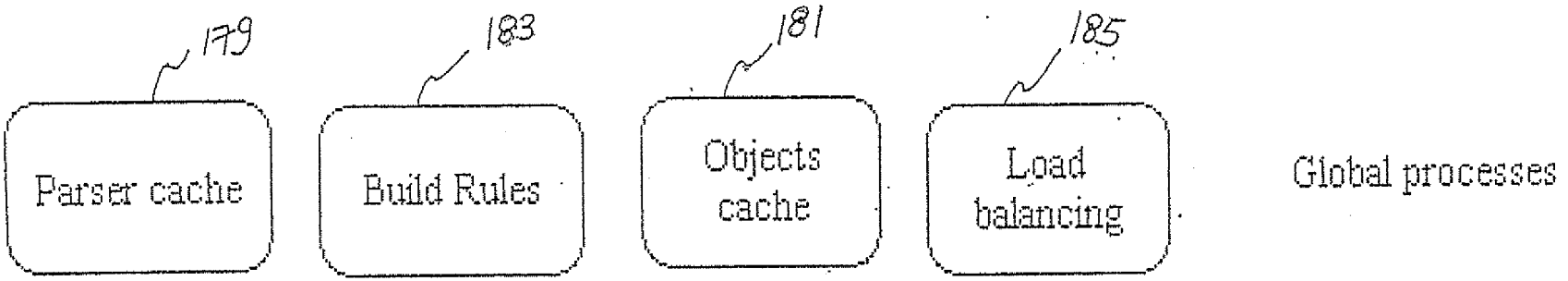

Disconnect
Updates
Queries
Connect
Database session steps
171
169
167
165
175
173
Database update
Database query
177
Routing, handling quality of service and pooling

FIG 8


179
183
181
185
Parser cache
Build Rules
Objects cache
Load balancing
Global processes

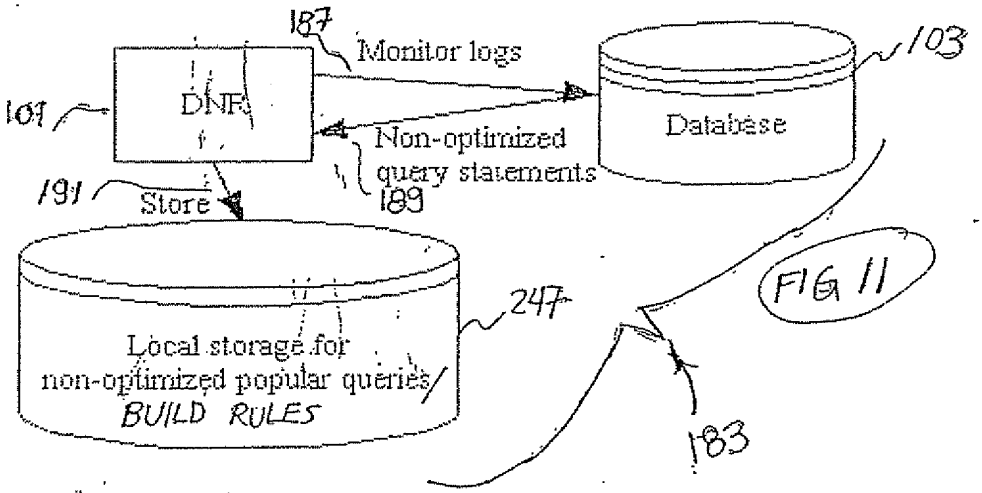


FIG 11

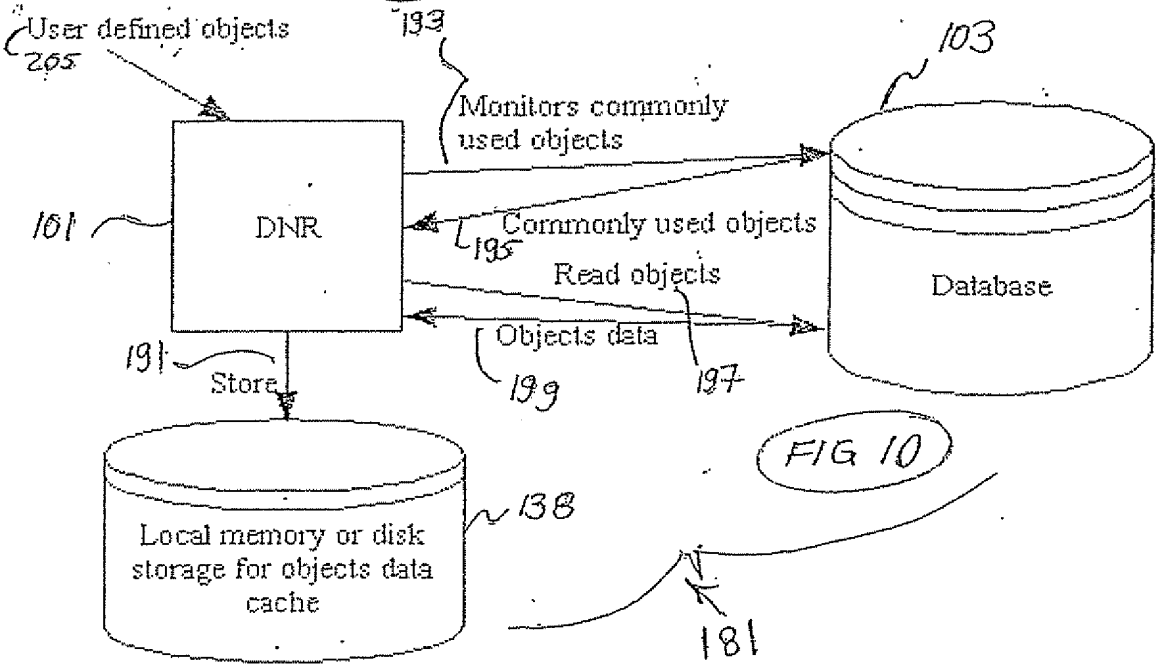


FIG 10

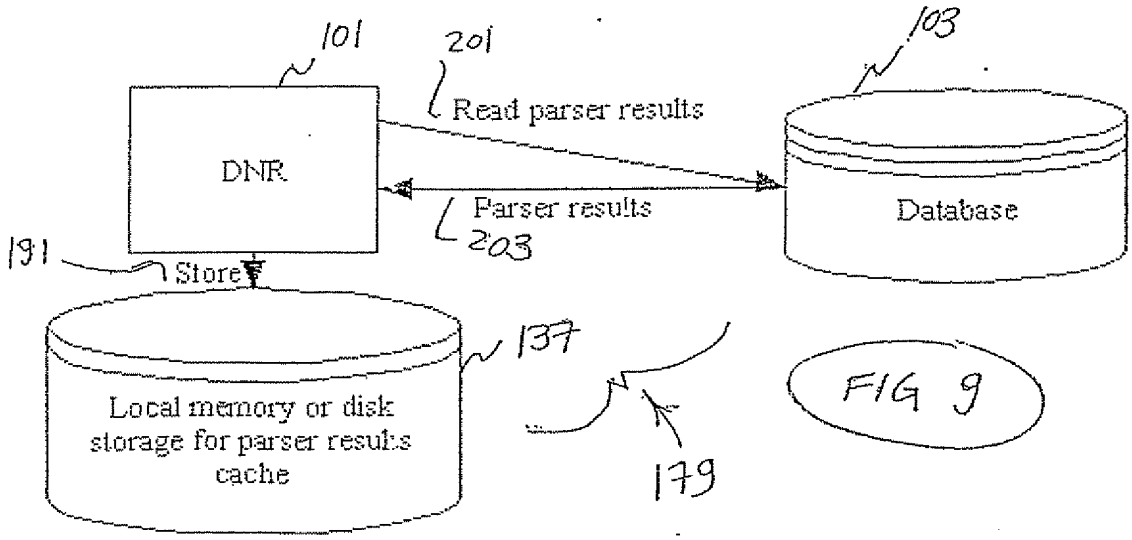
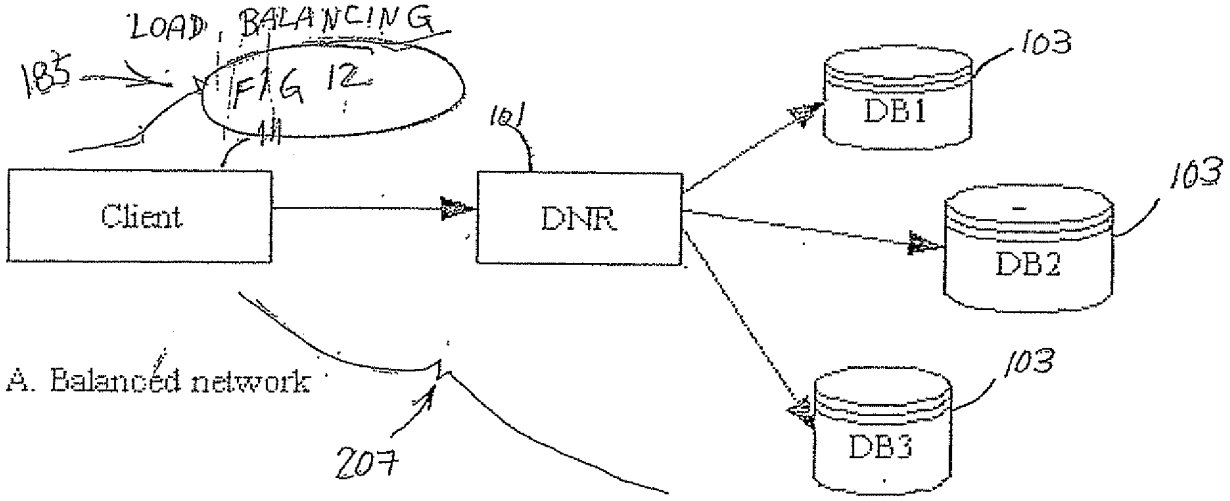
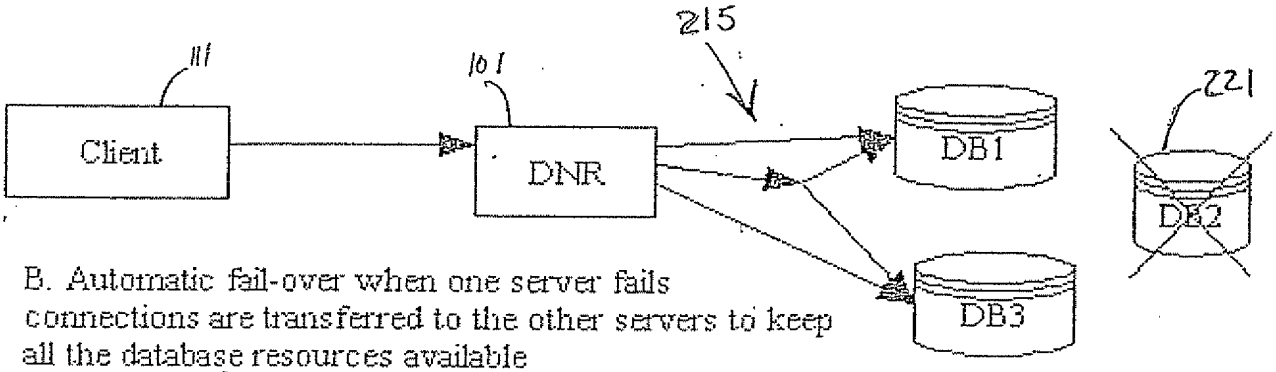


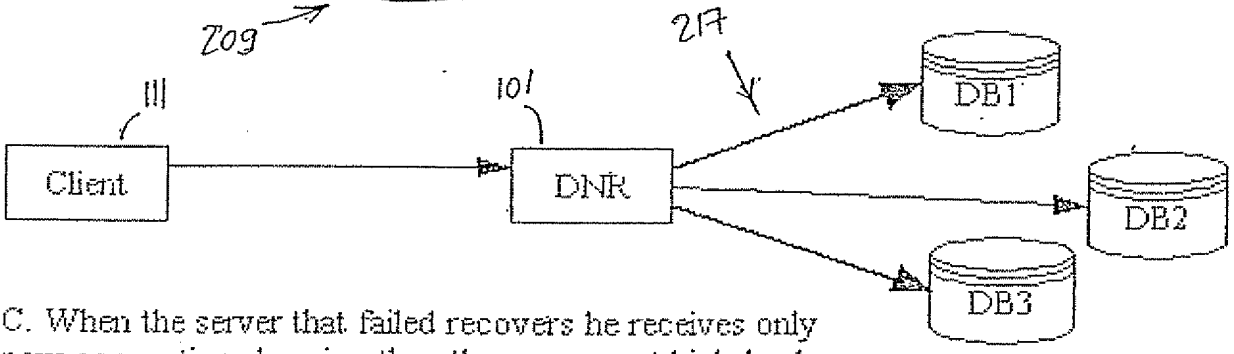
FIG 9



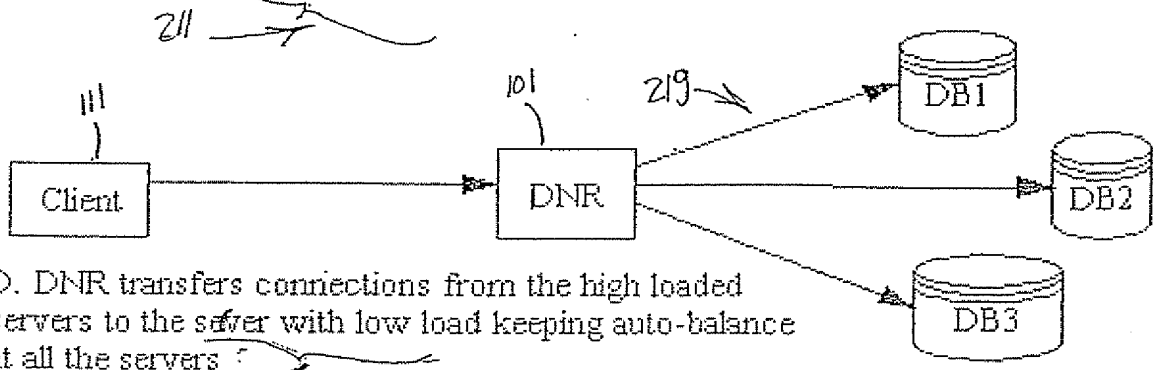
A. Balanced network



B. Automatic fail-over when one server fails connections are transferred to the other servers to keep all the database resources available



C. When the server that failed recovers he receives only new connections keeping the other servers at high-load



D. DNR transfers connections from the high loaded servers to the server with low load keeping auto-balance at all the servers

213

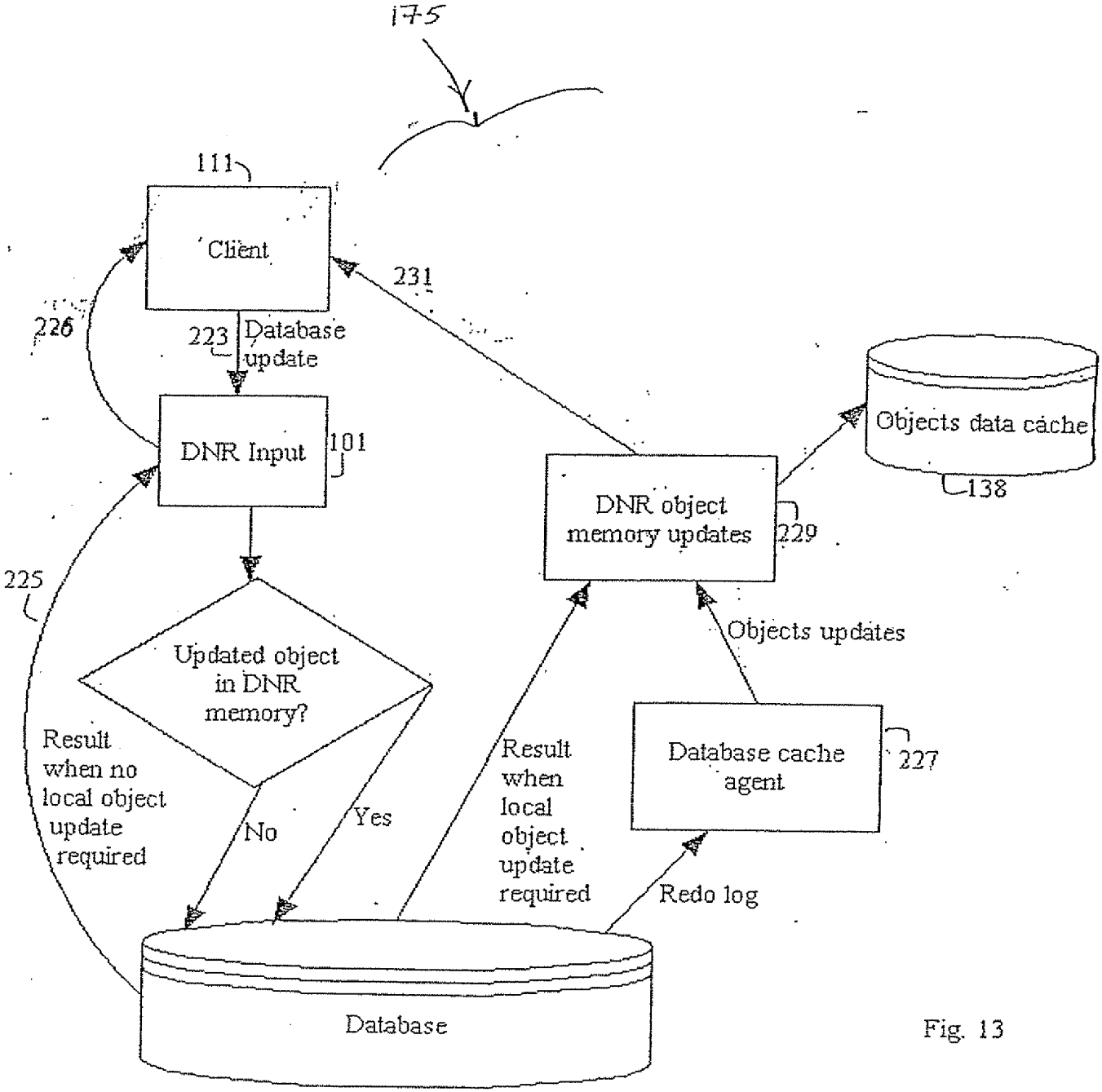

175
111
Client
231
226
223
Database update
DNR Input
101
Objects data cache
138
DNR object memory updates
229
225
Objects updates
Updated object in DNR memory?
Result when no local object update required
No
Yes
Result when local object update required
Database cache agent
227
Redo log
Database

Fig. 13

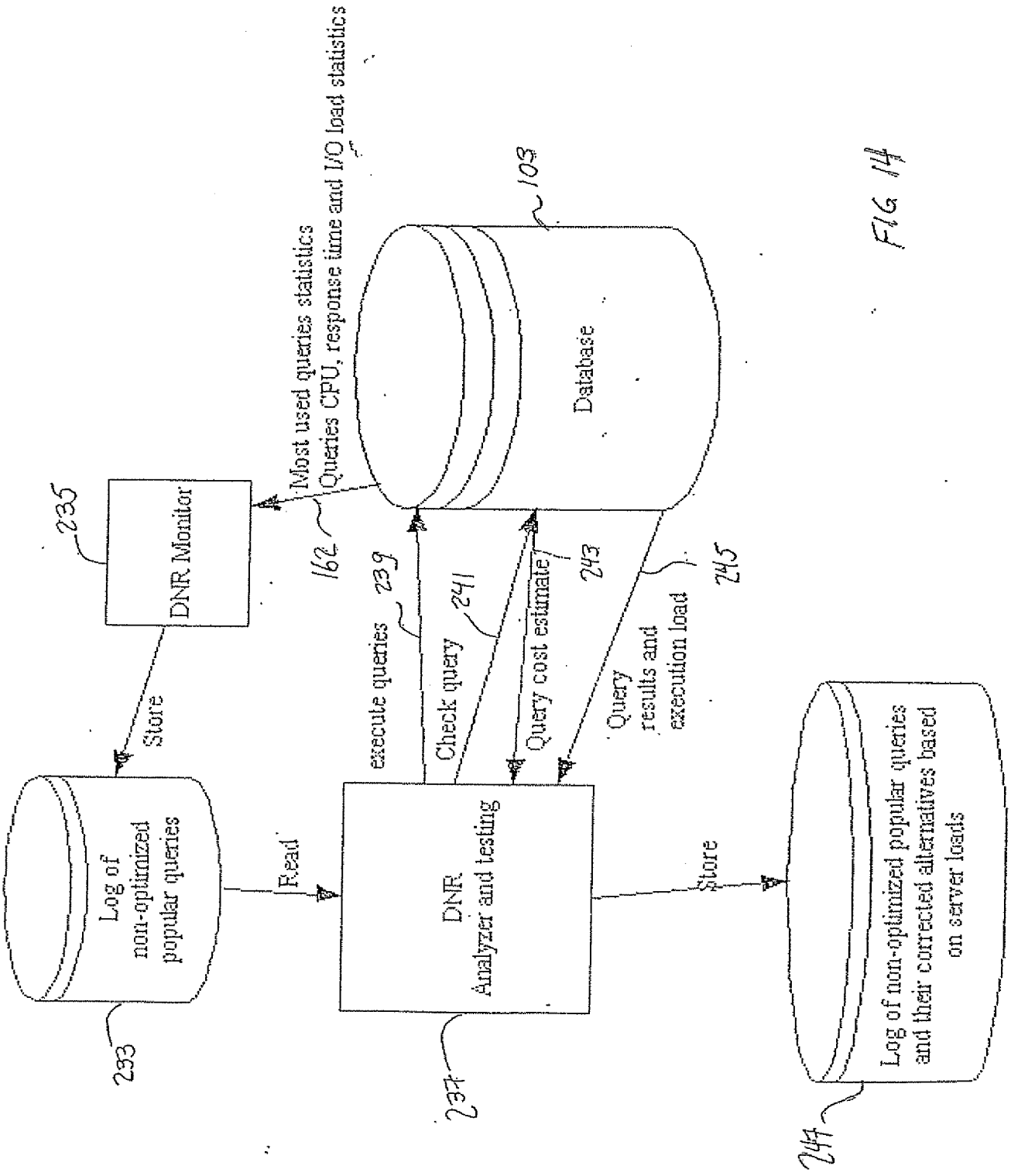

Most used queries statistics
Queries CPU, response time and I/O load statistics
103
Database
235
DNR Monitor
162
239
241
243
245
execute queries
Check query
Query cost estimate
Query
results and
execution load
Store
Log of
non-optimized
popular queries
Read
DNR
Analyzer and testing
Store
Log of non-optimized popular queries
and their corrected alternatives based
on server loads
233
237
244

FIG 14

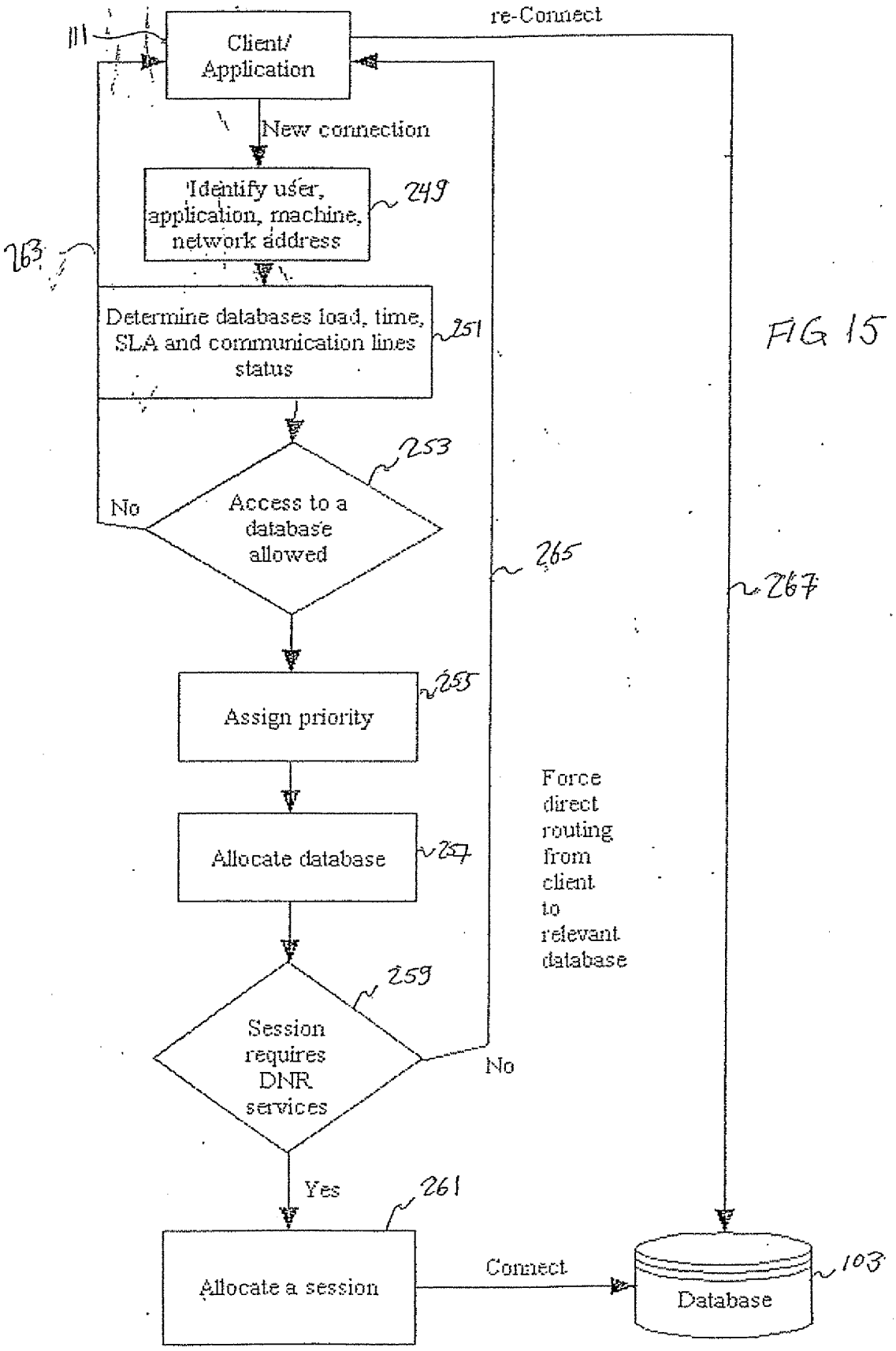

111
Client/ Application
re-Connect
New connection
Identify user, application, machine, network address
249
263
Determine databases load, time, SLA and communication lines status
251
253
No
Access to a database allowed
265
267
Assign priority
255
Force direct routing from client to relevant database
Allocate database
257
259
Session requires DNR services
No
Yes
261
Allocate a session
Connect
Database
103

FIG 15

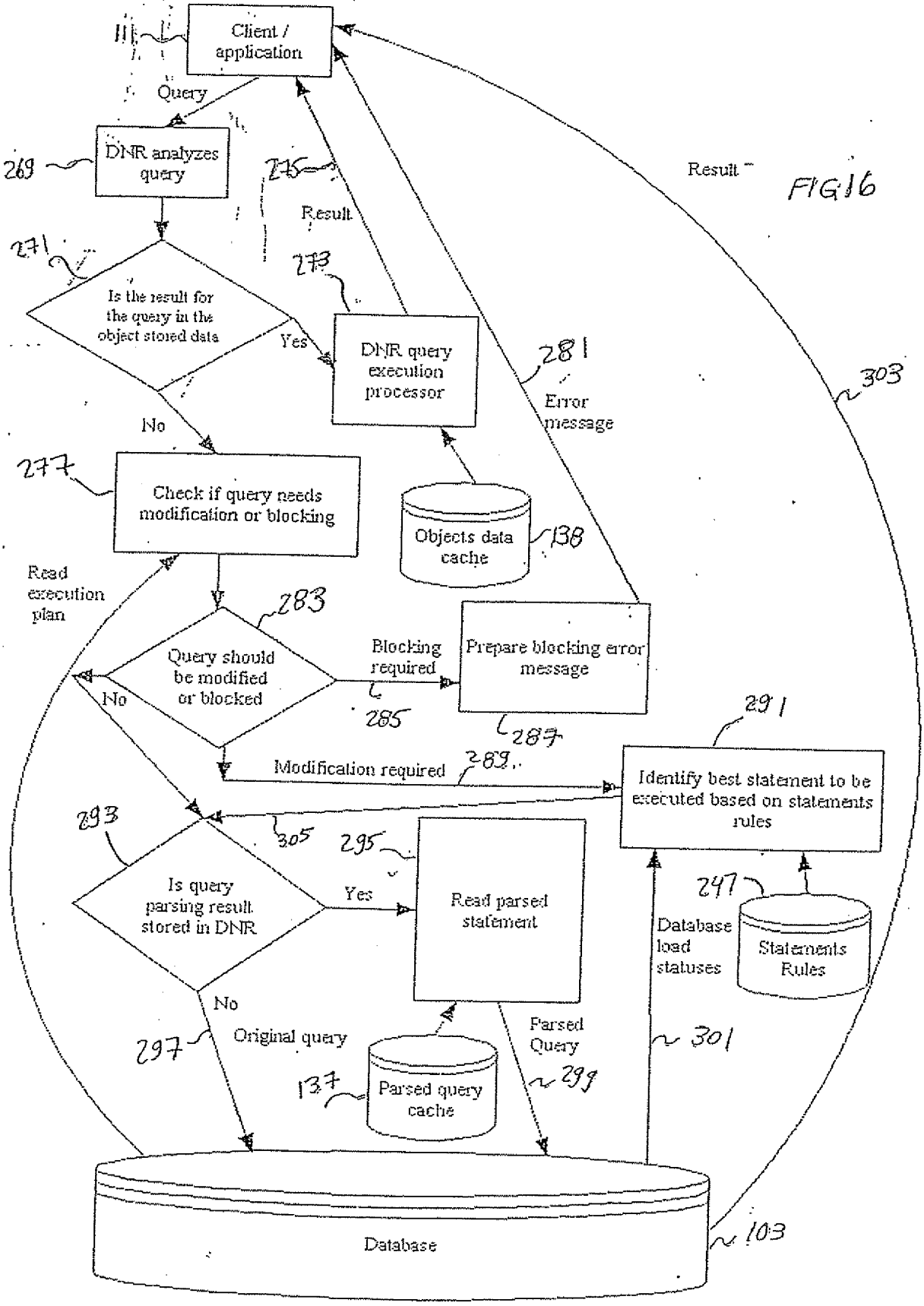

Client / application
Query
DNR analyzes query
269
Result
275
Result
271
Is the result for the query in the object stored data
Yes
273
DNR query execution processor
281
Error message
303
No
277
Check if query needs modification or blocking
Objects data cache
138
Read execution plan
283
Query should be modified or blocked
No
Blocking required
285
Prepare blocking error message
287
291
Modification required
289
Identify best statement to be executed based on statements rules
293
305
295
Is query parsing result stored in DNR
Yes
Read parsed statement
247
Database load statuses
Statements Rules
No
297
Original query
Parsed Query
299
301
137
Parsed query cache
Database
103

FIG 16

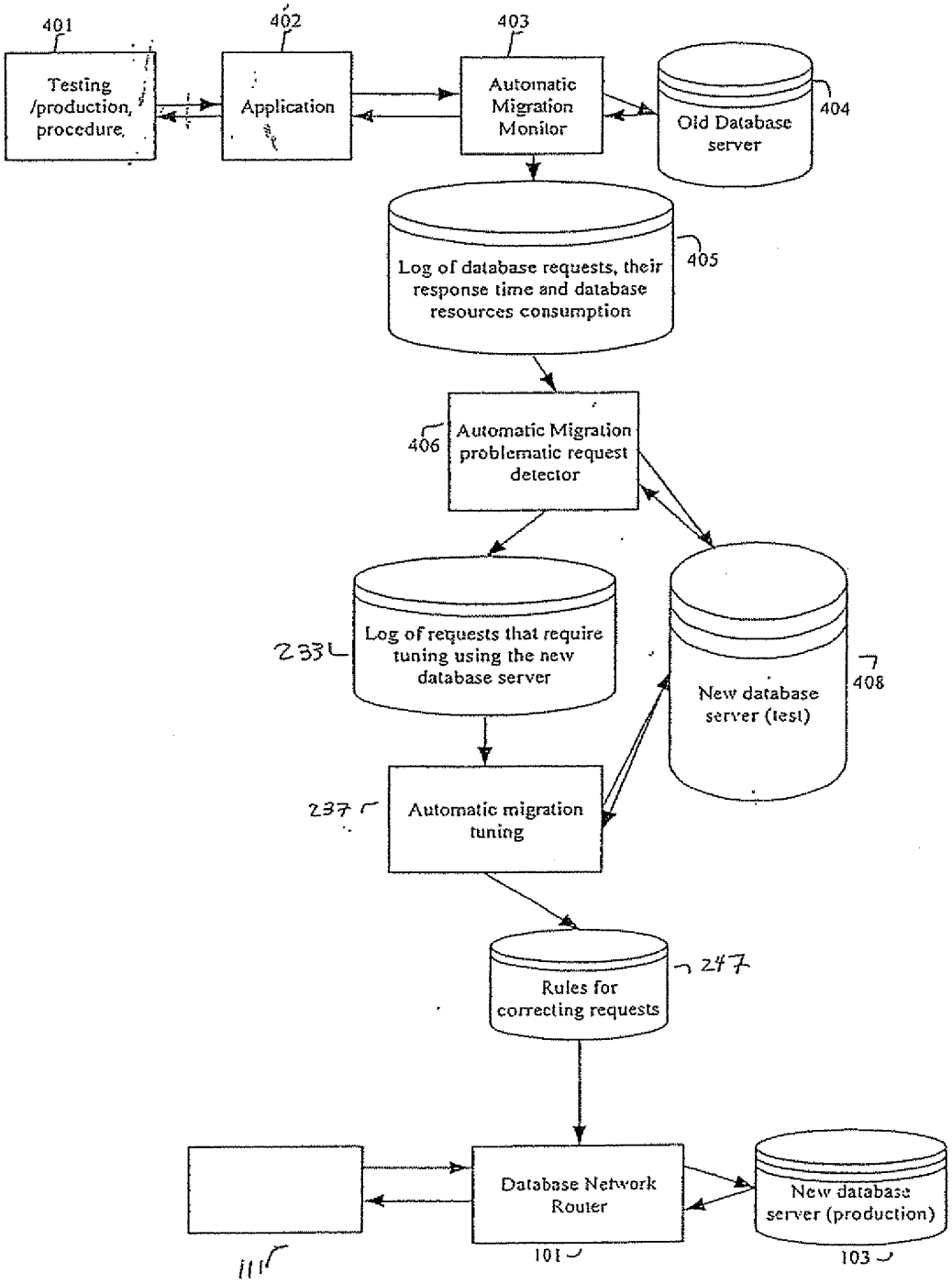

401
Testing /production, procedure
402
Application
403
Automatic Migration Monitor
Old Database server
404
Log of database requests, their response time and database resources consumption
405
406
Automatic Migration problematic request detector
233
Log of requests that require tuning using the new database server
New database server (test)
408
237
Automatic migration tuning
Rules for correcting requests
247
Database Network Router
101
New database server (production)
103
111

FIG 17